

Remarks

Thorough examination by the Examiner is noted and appreciated.

The Specification has been amended to correct grammatical and typographical errors and make the specification consistent with the claims and disclosure. For example CF₄ has been corrected to be designated as a fluorocarbon. A "carbon/fluorine" ratio has been corrected to read a fluorine to carbon ration consistent with claim 12 and the disclosed gases.

The claims have been amended and new claims added to better clarify Applicants claimed invention.

Support for the new claims is found in the original claims and/or Specification. No new matter has been entered.

For example, support for limitations in claims 9 and 14 are found in originally presented claims and the Specification.

For example at page 18, paragraph 0036:

"Following the dry development process of photoresist layer 20 to form an etching mask, the first photoresist layer 22 may be optionally removed as shown in Figure 1D by a first in-situ ashing process using an oxygen-containing plasma. Additionally, the plasma may contain nitrogen and fluorine

U.S.S.N. 10/032,353

to aid in cleaning the plasma reactor chamber of residual particle contamination. For example, exemplary suitable conditions for the first in-situ ashing step of the present invention include flowing into the plasma reactor chamber a hydrofluorocarbon, for example, CF_4 at 20 to 50 sccm and flowing O_2 at 10 to 20 sccm at a pressure of 5 to 20 mTorr while maintaining a first RF power source at about 200 to about 300 Watts and a second RF power source at about 100 to 150 Watts. The plasma reactor chamber ambient may optionally **include a source of nitrogen**, for example, flowing at about 10 to about 30 sccm."

and at page 19, paragraph 0037:

"During the first or second ashing process, **nitrogen or fluorine-containing gases** may be added to the plasma to optimize the ashing process for simultaneous cleaning the plasma reactor chamber surfaces (plasma contact surfaces) of residual particles. Exemplary suitable ashing conditions are the same as those detailed for the ashing process for photoresist layer 20."

Claim Rejections under 35 USC 102

Claims 1, 6, and 7 stand rejected under 35 USC 102(e) as being anticipated by Young et al. (6,514,672).

Young et al. discloses a process for dry developing a photoresist bi-layer having a non-silicon containing underlayer and a patterned silicon containing overlayer. Young et al. discloses using a sulfur dioxide (SO_2) and oxygen (O_2) plasma source gases (dry development chemistry). Young et al. is consistent with the state of the prior art disclosed by

U.S.S.N. 10/032,353

Applicants in the Specification where the use of SO₂ is taught to be a problem causing roughened edges, a problem which Applicants disclosed and claimed invention overcomes.

Young et al. does not disclose, teach or suggest using a dry development chemistry including CO and O₂ plasma source gases in a dry development step. Young et al. is clearly insufficient to anticipate Applicants disclosed and claimed invention.

Claims 1, 3, 5 stand rejected under 35 USC 102(b) as being anticipated by Horn (5,925,494).

Horn discloses a process for PECVD depositing a polymer film which is disclosed to be suitable for depositing photoresist including using a silylation process to silylate and upper portion of the photoresist (see Abstract). Horn discloses a process whereby the silylated (photoactive) polymer layer is exposed to radiation followed by dry developing the entire photoactive polymer layer using an oxygen (O₂) plasma (see e.g., col 3, line 62 to col 4, line 15; col 4, lines 53 - 64; col 18, line 44-61).

Horn does not disclose a non-silicon containing photoresist layer and an overlying silicon containing photoresist as

U.S.S.N. 10/032,353

disclosed and claimed by Applicants. Horn does not disclose a separate step of dry developing the underlying non-silicon containing photoresist layer following patterning of the overlying silicon containing photoresist as disclosed and claimed Applicants in claim 1, including forming a dry development photomask form the silicon containing photoresist layer as claimed by Applicants in new claim 23. Rather, Horn specifically teaches away from the use of a bi-layer photoresist (see col 14, lines 10-24).

More importantly, Horn does not disclose a dry development chemistry comprising O₂ and CO as disclosed and claimed by Applicants.

Wither respect to claim 3, Examiner is mistaken in asserting that Horn et al. disclose a "wherein the non-silicon containing photoresist layer comprises a non-photoactive polymer" as claimed by Applicants. Examiner cites column 8, lines 5-15 which generally discusses PECVD deposition of a polymer layer, but not in the context of using the polymer layer as a photoresist. Rather, referring to example 5 at column 12, lines 40-44, Horn makes clear that in a silylation photolithography application, the PECVD polymer layer is indeed photoactive. This fact is also made clear in col 4, lines 27-42.

U.S.S.N. 10/032,353

Horn is clearly insufficient to anticipate Applicants disclosed and claimed invention.

Claim Rejections under 35 USC 103(a)

Claims 4, 8-19, stand rejected under 35 USC 103(a) as being unpatentable over Horn (5,925,494) in view of Young et al. (6,514,672).

Statement of Common Ownership Pursuant to 35 USC 103(c)

Applicants' attorney of record state that Young et al. (6,514,672) and Applicants instant application were, at the time the invention was made, commonly owned by Taiwan Semiconductor Manufacturing Company. Therefore, Examiners use of Young et al. as a reference in a 103(a) rejection appears to be improper under 35 USC §103(c).

However, while not agreeing Young et al. may be properly be used as a reference in a rejection under 103(a), assuming *arguendo* that it is a properly used reference, Applicants respectfully traverse Examiner's rejection under 35 U.S.C. 103(a).

Applicants reiterate the comments made above with respect to rejections under 102(e) and 102(b). As pointed out, neither the

U.S.S.N. 10/032,353

disclosure nor teachings of either Young et al. or Horn produce Applicants invention, therefore no combination produces Applicants disclosed and claimed invention. Moreover, there is no motivation for combining Young et al. and Horn since they are directed at entirely different processes. Young et al. discloses a bi-layer photoresist similar to Applicants disclosed and claimed invention, but teaches using an SO₂ and O₂ dry development chemistry. Horn does not disclose a bi-layer photoresist as claimed by Applicants in claim 1, but discloses a single photoresist layer deposited by a PECVD process, silylated, and dry developed with O₂. Horn discloses an entirely different process not applicable to either Young et al. or Applicants claimed invention. Nevertheless, such combination does not produce Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

"A prior art reference must be considered in its entirety, i.e., as a whole including portions that would lead away from the

U.S.S.N. 10/032,353

claimed invention." *W.L. Gore & Associates, Inc., Garlock, Inc.,*
721 F.2d, 1540, 220 USPQ 303 (Fed Cir. 1983), cert denied, 469
U.S. 851 (1984).

"If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." *In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).*

Since Examiner has not shown a *prima facie* case of obviousness with respect to the independent claims, neither has one been shown for the dependent claims.

The Claims have amended and new claims added to clarify Applicants claimed invention. A favorable consideration of Applicants' claims is respectfully requested.

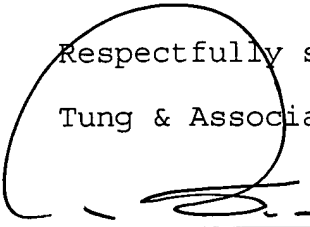
Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

U.S.S.N. 10/032,353

In the event that the present invention as claimed is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

Tung & Associates



Randy W. Tung
Reg. No. 31,311
Telephone: (248) 540-4040